CORRESPONDENCE.

FURTHER CONTRIBUTION TO SELECTION THEORY AND ITS ALTERNATIVES,

E. W. MacBride.

In the October number of the Eugenics Review there appears an article entitled "Selection Theory and Its Alternatives," from the pen of the distinguished entomological systematist, Dr. Guy K. Marshall, in which he severely criticises *inter alia* a review of mine which concerned itself with "Nomogenesis" by Dr. Bergh, a book which denied the efficacy of natural selection. I was unwilling, after my reply to Prof. Goodrich, in the same number, to re-open the controversy, but such criticism from such an eminent biologist as Dr. Marshall cannot be passed over in silence.

I stated that (1) "natural selection is purely negative; it weeds out but cannot create," and (2) "what the belief in natural selection as an efficient agent really implies is the constant occurrence of small inheritable variations in all directions. This assumption is directly contradicted by every relevant experiment designed to that point. If the conditions are kept constant selection is powerless to effect progressive change." The reply made to the first objection is "that it is a misuse of terms to suggest that the effects of elimination are purely negative, for the persistent destruction of individuals of a certain type must affect the trend of variation." To the second, "that the case has been presented the wrong way round in order to score a debating point," I will only remark on this suggestion that in discussing fundamental points of biology I wish to get at the truth, not to exhibit forensic skill. "Variations," Dr. Marshall says, "may be intermittent and yet selection may be the major agent in evolution."

Both these replies appear to involve confusion of thought. Natural selection can mean nothing more than "the survivors survive." It can produce no "trend of variation." If the trend is there, then it can unmask it, but in that case the trend, which I interpret as the Lamarckian response to environment, is the really effective agent and natural selection merely the limiting or pruning factor.

Secondly, by continuous variation, I meant continuous in degree, not necessarily in time. Since evolution has proceeded by infinitely small gradations, if selection be its cause the variations must differ from one another by infinitesimal amounts. And they must be in all directions, since if they are not, the direction of variation is the cause of evolution and not the selection.

The efforts to upset the evidence derived from "pure lines" that the minute differences between members of a brood are not inheritable is singularly unfortunate. Castle's experiments on hooded rats are cited, and the statement that D. Banta has produced changes in Daphnids by selection under constant conditions. Now, Dr. Castle has withdrawn his interpretation of his results and falls back on the mutationist argument of multiple factors, and I refuse all credence to Banta's results, for the following reason:—Three organisms as widely separated from one another in the scale of life as Paramecium (a protist), the bean (a flowering plant), and Simocephalus a Daphnid, have been examined by three independent first-class observers, and all three come to the conclusion that these minute variations are not inheritable. Dr. Agar examined Simocephalus, and I recommend Dr. Marshall to read his paper in the Phil. Trans. of the Royal Society; he will then see which I utterly refuse to accept Banta's results.

I quote again: "Lamarckism breaks down hopelessly in the case of neuter insects." It is true that these insects, since they leave no progeny, can hand on

nothing to future generations, and the selection theory is inapplicable in their case as well. All the available evidence tends to show that the peculiarities of these insects are due to the special *nutrition* which they receive, for the very young nymphs of worker, soldier and imago are indistinguishable, and Grassi says that in Calotermes the workers can make a nymph into a soldier or a worker according to necessity.

In conclusion, I should like to add a few general remarks. It is insisted that the selection theory is to be commended because it can explain so many things and that "its remorseless logic and wide applicability" excite a rage in the minds of its opponents. What excites irritation in the mind of opponents is that "the explanations" in terms of the selection theory are not explanations at all, but mere verbal jugglery. When to "explain" means to make wild unsupported guesses as to the course of evolution, and then to postulate every conceivable sort of chance variation to account for the changes which are assumed to have occurred, then indeed anything in heaven or earth can be explained. Thirty-three years ago Dr. Bateson said of such reasoning "Surely it is time that these brilliant and facile speculations were no longer made in the name of science." Neo-Lamarckians maintain that the first requisite is by all the available evidence to determine the actual course of evolution—and then, and then only, to seek for causes. Until we know the history of the development of neuter insects it is futile to speculate on the causes which produced them. Dr. Marshall seems to think that if Lamarckism is proved to be true (which incidentally it has been) it would injure the Eugenic cause. Nothing could be further from the truth. No one insisted more strongly on the slowness of evolution and the importance of the time-factor than Lamarck. The innate qualities of human races are the outcome of tens of thousands of years of reaction to environment, and the contact of different races is the major Eugenic problem, and Lamarckism discourages all expectation that education and philanthropy will in a few generations change a brown man into a white.

Dear Sir,

In answer to Professor MacBride's article on "Darwinian Interpretations," in the October Number of this Review, it may be said that the position held by many others besides myself concerning variation and inheritance is set forth in my book, "Living Organisms" (Clarendon Press, 1924). Such questions can not be settled by appeal to authority, but to well-established scientific evidence, and in this connection it may be pointed out, with regard to the experiments on mice mentioned by Professor McBride, that Professor Pavlov has himself withdrawn his statements as incorrect. Convincing evidences cannot be obtained from systematic biology, palæontology, or anatomy, but only from observations and experiments on living animals and plants.

E. S. GOODRICH.

(EDITORIAL NOTE.—Lest Professor MacBride's letter in the last number of the REVIEW should give the ordinary reader a totally disproportionate idea of the differences separating experts on matters of importance to eugenists, we may say that both Professors Goodrich and MacBride firmly believe in the importance of natural selection as a factor in evolution. But natural selection—the weeding out of the unfit—can produce no effect unless the variations are inherited. The difference between the two Professors concerns the nature of these variations, whether they are all of the same kind, what causes determine them, and whether they are all inherited. Whereas Professor MacBride adopts the Lamarckian interpretation of inheritance, Professor Goodrich does not. Both would admit that, in any case, the animal which survives is the one which is best adapted to the environment, so that on both views the strongest and most vigorous survive whilst the weaklings perish.)